# Book Review

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### Book Review Editor

**The Structure of Knowledge: Classifications of Science and Learning since the Renaissance**, edited by Tore Frängsmyr.
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The International Summer School in History of Science which started its activity in 1988 as a joint initiative between the universities of Bologna, Uppsala, Berkeley, and Paris (since 1994) held some programs of lectures and discussions. The first theme held at Bologna (1988, August 29 – September 9) was "New perspectives on Enlightenment science." Statistics covering period 1988 to 2006 provided by Matteo Serafini (http://www.cis.unibo.it/ISSHS%201988-2006%20def.pdf) show that totally, 555 participants, 179 participating institutions, and 19 participating countries (connected with the institutions) have had different contributions in holding various biennial programs of the School, which in turn is an indicator of the importance, richness, and common wisdom of issues discussed. One of them has been held in Uppsala (1998, June 7-13) with the theme "The Structure of Knowledge: Classifications of Science and Learning since the Renaissance." Because of the importance and value of lectures presented in Uppsala, Tore Frängsmyr (Uppsala University, Sweden) revised, edited, and compiled a book with the same title, which consists of five lectures delivered at the event. The contents in the book are as below:

1. Building the house of knowledge: The structures of thought in late Renaissance Europe by Paula Findlen;
2. Epistemological angst: From encyclopedism to advertising by Robert Darnton;
3. Linnaeus and the classification tradition in Sweden by Tore Frängsmyr;
4. Humboldtian distribution maps: The spatial ordering of scientific knowledge by Nicolaas Rupke;
5. The old production of knowledge: The academic system of science in Sweden, 1880–1950 by Sven Widmalm

According to Nobleprize.org (2011), the editor, Tore Frängsmyr holds a professorship in the History of Science at the University of Uppsala, Sweden. He is also director of the Center for History of Science at the Royal Swedish Academy of Sciences and editor of Les Prix Nobel, the yearbook of the Nobel Foundation, published since 1901. His books include Linnaeus, the Man and his Work (1983, new edition 1994) and Science in Sweden: The Royal Swedish Academy of Sciences, 1739-1989 (1989).

In the introduction of the book, he says that "when we decided on "The Structure of Knowledge: Classifications of Science and Learning since the Renaissance" as the theme of the 1998 Summer School, we hoped to examine the history of science from an unusual point of view. By showing how knowledge had been arranged at different periods, we could give a picture of the intellectual ambitions of society at a particular time. Within this framework, each lecturer was free to select a subject and angle of approach. No one was expected to deal with an epoch or a century. Everyone was asked to spotlight something typical or fundamental during a particular period" (2001, 2). Frängsmyr also adds that the papers published in the book are revisions and in some cases abridgements of the lectures.

The book starts with an introduction written by Tore Frängsmyr, who properly highlights the role and necessity of knowledge organization in the evolution, development, and preservation of human science during time. In line with this as well as the title of the work, he declares that "it is only when empirical knowledge or theoretical insight acquires form that it begins to function. It acquires form by being structured and classified, by being arranged in a context. Classification is not something dead or mechanical – it is essential to the development of scientific work … the first stage of work in the sciences often consists in

collecting empirical material. It is not only read and studied, examined and compared, but also ordered and structured, as a part of the scientific analysis. Systematization or classification may serve both as an ordering principle for accepted knowledge and as a guide for further work. Classification is not only used as a method but also as a theory" (2001, 1). Accordingly, the book deals with a main part of the history of science from the knowledge organization perspective since renaissance. Hence, the five discussions concerning five centuries have been ordered from the renaissance to the mid of 20th century.

**1. Building the house of knowledge**

Paula Findlen studies the relationship between knowledge and place in a European context. She believes that in 16th and early 17th-century Europe, the idea of structuring knowledge was more than just a metaphor. It expressed a literal desire to give the world of ideas a concrete physical context, often based on idealized structures that, at first glance, seemed to have very little to do with the actual content of learning. New kinds of knowledge frequently emerged in relationship to new buildings projects. Museums, libraries, memory theaters, botanical gardens, anatomy theaters, laboratories, and observatories all were an integral and strikingly novel part of late Renaissance science. Closely linked to a humanistic culture of learning that reinvented many ancient scientific disciplines, they materially transformed the way scholars worked, taught, and experienced nature. This is what can be found in Ophir (1991, 165), "the institutionalization of special places for the search for knowledge, was a crucial stage in the historical process that constituted science as an established cultural system." Findlen traces such an association between place or location and knowledge in the formation of modern disciplines. Emphasizing that scientific practitioners historically have been active participants in shaping the contexts in which they work, building the house of knowledge as they developed their ideas, Findlen tries to find an acceptable response to the question "how distinct locations have affected specialized and different forms of knowledge"? Following Thompson (1999) Findlen demonstrates the role played by specific Early Modern physical locations (symbolic and real) such as "memory theaters," anatomical theaters and botanical gardens, in preparing the way for the emergence of the idea of the modern scientific discipline.

In the form of three sections named "Modeling knowledge," "Modeling nature, and "Science and design," which provide the reader with a general picture of attempts done to model knowledge and nature on the road of building a single house for the inclusion of humankind's knowledge rooted in nature, the author indicates that "designing and redesigning the place of knowledge was one of the means by which natural philosophers struggled with the problem of how to define the nature of the knowledge the sought... The question of structure, in other words, was also a question of discipline" (2001, 11). As a matter of fact, the philosophers and thinkers of years after Renaissance posited that nature is the original encyclopedia. Hence, possessing, dissecting, and investigating nature is a precondition to model or capture knowledge.

As a closing remark of this section, Findlen's note regarding the discussion seems to be interesting as well as useful (2001, 38):

> Science was indeed shaped by its structure in Renaissance Europe. Their design was a fundamental expression of the kind of knowledge scholars sought. Changes in design also reflected a revision of these intellectual goals. In such transformations, we can see the extent to which the encyclopedia of knowledge strained under the burden of containing all knowledge in a single site, a single design, or a single building .... The connections between the different projects of knowledge were often made evident by the connections between buildings.

Totally, reading "Building the house of knowledge: The structures of thought in late Renaissance Europe" which bespeaks one of the main origins of scientific innovations, Renaissance, will be fascinating and satisfying.

**2. Epistemological angst**

In the article "Epistemological angst: From encyclopedism to advertising," Robert Darnton deals with the age of Enlightenment form the perspective of encyclopedism movement. He examines the structure of knowledge represented in Diderot's Encyclopédie and in subsequent encyclopedist projects, and he linked these changing intellectual structures to the transformation of social structure and political power in eighteenth-century France (Thompson 1999). The term 'Epistemological angst' has been used in the title because, according to the editor (p. 2), encyclopedism shifted epistemology through the new classification of knowledge, and also because it taught social reform. Moreover, such a movement like an advertisement has had some positive intellectual outcomes for its pioneers including prestige, social status, respect, etc.

As highlighted in the first article, there has been the aspiration to gather the entirety of humankind's knowledge into one house or unified tree since before the Renaissance. This desire is also felt in the age of The Enlightenment that accelerated publishing both secondary and original sources. In order to respond to a need for easy access to a compendium of knowledge or wealth of information (Mohammadi and Isfandyari-Moghaddam 2008), encyclopedias flourished during the years after Renaissance.

Due to the importance of encyclopedias in the preservation and free development of science, the social condition these resources during the Enlightenment age is the main question Darnton wants to address. He begins his discussion with posing the question "what was so shocking about the [Diderot's] Encyclopédie?" (p. 53). He adds that on the face of it, Diderot and d'Alembert merely presented the public with a compendium of information on everything from A to Z. Yet the Encyclopédie was a banned book. It touched off the greatest struggle for freedom of expression in the century and became the bible of the Enlightenment. Why did it arouse such passion?

Darnton maintains that most of today's people know the Encyclopédie only by reputation. However, Enlightenment contemporaries considered it an infernal machine, whose authors tried to restructure all knowledge and to draw boundaries between the knowledge and the unknowable in a way that challenged the Church and all the orthodoxies of the Old Regime.

In addition to making interesting references to the organization of an encyclopedia applied by Diderot and d'Alembert and Chambers, illustrating the Bacon's two trees of knowledge, Chamber's tree, and Diderot and d'Alembert's tree, and reconsidering the publishing history of Encyclopédie, he clearly as well as elaborately highlights his understanding surrounding the terms 'angst' and 'advertising' which can be traced during those days (p. 75): "Diderot shook the ground of knowledge …. In fact, a great mutation occurred two centuries ago. Philosophers and publishers, each in their own way, collaborated in an enclosure movement, which laid out the main lines of the intellectual landscape that we still inhabit."

In a nutshell, studying history of science in relation to a certain era and a given information source, i.e., encyclopedia (and here, Encyclopédie), what Robert Darnton presents in this article, reminds us of the power of knowledge at moments in history when it is truly treated as power or a creator of power. That is why, when authors and editors of encyclopedias map knowledge based on new paradigms, such a work could act as the potential to change the established epistemological foundations. And, this power was so considerable that the Encyclopédie publishers congratulated themselves not only for pulling off the greatest coup in the history of their trade, but also for spreading the Enlightenment. In fact, this is what can be associated with the real power of a knowledge organization system.

### 3. Linnaeus and the classification tradition

As author, Tore Frängsmyr plays a role in the present collection through writing "Linnaeus and the classification tradition in Sweden." Since theories of classification in reality often mean 'ideas' or 'principles' of classification (Smiraglia 2001 and 2002; quoted in Mai 2004, p. 40) and the basis for a science of classification is uniquely definable items of knowledge (Farradane 1952; quoted in Mai 2004, p. 40) and the creation of relations between these items of knowledge (Mai 2004), paying attention to the history of classification and taxonomy of world of knowledge from the natural history standpoint is of value and interest. Accordingly, Frängsmyr discusses the subject of classification so that a window on theories of classification can be opened. This time we look at classification from the perspective of natural history, or to be precise, knowledge of nature. Highlighting the twofold importance of subject 'natural history' – firstly, for dealing with a useful description of nature, and secondly, for demonstrating the greatness of the Creator–he posits that classification came to play an important role. Practically, it was essential to distinguish different plants and to avoid confusing edible plants with poisonous ones. And in a religious sense, classification could give an insight into the structure of creation (p. 77). In this line of thinking, the author discusses Carl Linnaeus (1707-1778) and his model of classification which can be also treated as a tradition and basis for the development of Swedish science. In the form of four foundational parts namely 'The young Linnaeus', 'The systematist and the reformer', 'Linnaeus' view of nature', and 'The successors', he historically provides the reader with the life and impact of Linnaeus with an emphasis on his knowledge organization system. Main issues debated by Tore Frängsmyr about Carl Linnaeus can be found in Lambe's (2011) following sentences:

> Linnaeus' great gift to science was threefold. Beginning with his *Systema Natura* in 1735, he introduced a far simpler principle of distinguishing between species based on anatomical observation than had ever been proposed before. Beginning in 1737 with his *Critica Botanica* he laid down the

> rules for his binomial naming system for species which riled his critics immensely (because he substituted so many older naming conventions with his own), but when widely adopted created the first standardized way of describing species. This immeasurably enhanced scientific coordination and collaboration. Finally, his hierarchical, nested classification tree structure turned out to be a perfect vehicle to express the genealogical relationships that gained such prominence during the emerging evolutionary theories of the late eighteenth and early nineteenth centuries. Linnaeus' new taxonomic method simplified the task of categorization, imposed rigorous rules (and therefore consistency), and established a form of representation that history turned into a lucky bet. From the point of view of advancing scientific method, his focus on analysis, rules and standardized approaches, gave an incalculable advantage.

To sum up, in terms of his theory of classification, or to be precise, his idea or principle of classification which really can be considered as a basis for the science of classification, Frängsmyr concludes that "much of the work done in classification and systematics had been based on quantitative calculations from the time of Linnaeus… The Linnaean inheritance has proved unusually strong" (p. 91). Reading Carl Linnaeus' knowledge organization system and in fact, rethinking his thoughts will have good lessons, research topics, and theoretical horizons.

### 4. The spatial ordering of scientific knowledge

The focus of this chapter entitled "Humboldtian distribution maps: The spatial ordering of scientific knowledge," contributed by Nicolaas Rupke, is a kind of science that represented a major component of the nineteenth-century study of nature. The scientific practice put forward by Alexander von Humboldt is characterized by a preoccupation with the spatial distribution of natural phenomena. In fact, his endeavour is similar to natural philosophers Renaissance periods who sought to build a single house for the knowledge universe. Instead, Humboldt tries to reorganize the existing knowledge so that a universal science of nature can be formed. Revisiting Humboldtian science, it is emphasized that via a spatial turn in science a novel way to organize scientific knowledge, different from the ones long set forth in dictionaries of arts and science is presented from the late-18th century onwards (p. 93). Rupke finds that the distribution maps of Humboldt were by and large an accurate reflection of contemporary knowledge (p. 111). In general, a new structure of scientific knowledge examined here by Rupke depicts the history and evolution of one of the angles of classifying natural world knowledge, an outstanding event interpreted as 'a fundamental change in science' (p. 115) by Michel Foucault.

### 5. The old production of knowledge

In the last chapter "The old production of knowledge: The academic system of science in Sweden, 1880–1950," Sven Widmalm discusses the old production of knowledge. He deals with Swedish developments from the late 19th century to 1950, with an emphasis on the interwar years and on the natural sciences.

The academic system of scientific knowledge that Widmalm describes in the chapter has been more than a system of education and research, producing experts and useful knowledge. It has been a system of legitimation, acknowledging the relative autonomy of professional groups, including academic researchers and teachers, at least in principle. It has given political legitimation to a social force independent of part politics and of private enterprise: that of academic expertise (p. 151).

According to Gibbons et al. (1994), in the old production of knowledge of the early 20th century, little accountability (what Widmalm calls *neural ethos*) was needed as much of knowledge of the time was discipline-specific and knowledge producers were only accountable to other experts in the discipline. Given the rise of information technologies, network forms of organization, and the industrial application of knowledge, knowledge increasing needed to be more accountable to a variety of stakeholders, leading to the new production of knowledge.

In my opinion, being good performer at the age 'the new production of knowledge'–what Gibbons and his colleagues claim–requires enough knowledge about the nature and history of 'the old production of knowledge.' This means real accountability to our scientific ancestors, our contemporary experts whether in our discipline or other discipline(s), and our successors whether common individuals or the society of science.

### Conclusion

My concluding remarks are twofold. I will talk about structure and content.

In terms of structure, at the beginning, the book starts with a preface and an introduction, which contains an overview on the topic and explains the contents in brief. At the end, it has an index (of proper

names). For better identification of the 5 contributors of the book, it could have had a section entitled 'About contributors' which includes their affiliation and contact information so that future communications can be facilitated. Additionally, the book as a collected work lacks a conclusion chapter in which some remarks could be highlighted.

In terms of content, according to Tore Frängsmyr, together these five essays offer an unusual perspective on scientific process. Some of their results bear on today's discussions about research and its conditions and should be of interest to scientists as well as to historians and philosophers of science (p. 3).

Reading this book is like a five-century journey of discovery. It demonstrates a part of scientists' thoughts and investigations concerning organizing knowledge, specializing disciplines, and orienting the history of science. It also reminds us of Napoleon's saying, namely, 'The sword is beaten by the mind.' It was the mind of scholars and philosophers that turned the chaos of knowledge of past centuries into order, classification, and organization. Using such a *mind*, the production and application of knowledge has been fortifying, facilitating, and accelerating.

Although the book has a retrospective view, it has some valuable issues for prospective readers including historians, philosophers, and especially librarians and information professionals. To realize the increased number of future de facto readers, it is highly suggested that the copyright holder of the book lets interested individuals have easy access to its full-text through electronically publishing the work. I would like to close my review with Allen Vannérus's outstanding statement (p. 117):

> It is instructive, yes educational, to occupy yourself with the classification of the sciences, and if you do it painstakingly, the work can be rewarding to an unexpected degree. Hence it is something worthwhile. It is fruitful.

Again, reading this book dealing with the classification of the sciences can present readers with good opportunities.

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